IMPACT OF PSYCHO-PHYSIOLOGICAL TREATMENT TECHNIQUES ON COGNITIVE FUNCTIONING OF STUDENTS: AN INTERVENTION STUDY

A

SYNOPSIS

SUBMITTED FOR THE DEGREE OF

DOCTOR OF PHILOSOPHY

IN

PSYCHOLOGY

SUBMITTED TO

DAYALBAGH EDUCATIONAL INSTITUTE

(DEEMED UNIVERSITY)

DAYALBAGH, AGRA-282005

SUPERVISOR
Dr. Kamaljeet Sandhu
Associate Professor
Department of Psychology

RESEARCHER
Priya Gupta
Research Scholar
Department of Psychology

Head
Department of Psychology

DEAN
Faculty of Social Sciences

FACULTY OF SOCIAL SCIENCES
DAYALBAGH EDUCATIONAL INSTITUTE
(DEEMED UNIVERSITY)
DAYALBAGH, AGRA-282005

CONCEPTUAL FRAMEWORK

Since ancient Greek times, humans have wondered about the nature of emotions and the role they play in human life. Philosophers such as Socrates, Plato, Descartes, and Kant have considered the relationship between thinking and feeling in everyday human experiences. They have tried to explain influence of emotional and rational processes on behavior. Thinkers argue that emotion or affect surrounds human thinking and is a liability to rational, logical thought. Some thinkers have suggested that affect is an essential and adaptive component to cognition which expands rational thoughts (Forgas, 2008). Modern technological advances have come up with researchers from medicine, psychology, and physiology disciplines and gave opportunities to observe as well as investigate the interplay of affect and cognition in the context that ancient Greeks never imagined. Recently, advances in technology and cognitive neuroscience inspired cognitive psychologists to accomplish research in the field of emotion and cognition to understand the neural correlates of affect and the dimensions in which different affective states influence cognition.

Reasoning and emotions have been considered opposing forces since long. But, now psychological and neuro-scientific researchers reveal that emotion and cognition are closely knotted. The cognitive psychologists who desire to be familiar with the effects of emotion on cognition have most regularly manipulated participant's emotional states in an organized manner. On the other hand, some researchers (e.g., Lazarus, 1991; Smith and Lazarus, 1993) studied the influence of cognition on emotion. Cognitive processing is required to extract emotional responses also evoking some physiological responses, so it is not possible to have an acceptable theory, which includes cognition alone. Apparently, emotional responses transform and guide cognition to facilitate

adaptive responses to the environment. Emotion determines the manner in which, individuals perceive world, organize memory, and make complex decisions.

Out of the several modern approaches explaining the connection between emotion and cognition, Appraisal theories "seek to explain the cognitive genesis of emotions…and the functions they serve" (Forgas, 2008). Classic examples of appraisal theories are the James-Lange and Cannon-Bard theories of emotional arousal. These theories explore for physiological correlates of affective states and try to integrate an individual's interpretation of bodily sensations while unfolding the subjective experience of an emotion. Another class of affect-cognition theories, infusion models, enables to understand influence of emotional states on thinking. Some infusion theorists focus on 'the influence of emotional states on decision making and judgment processes, while others focus on how emotions influence information processing and the content which is stored in memory'. Finally, integrative theories of affect-cognition investigate emotion's influence both on content as well as process of cognition (Forgas, 2008).

Most studies initiate that mood induction results in changes in cognitive task performance (Darke, 1988; Elliman, Greene, Rogers, and Finch, 1997; Gray, 2001; Spies, Hesse, and Hummitzsch, 1996). Behavioral findings across various tasks and paradigms point out that perception is facilitated and attention is prioritized for emotional information. Emotional stimuli rapidly draw more attention and hold back attentional disengagement for extended time than neutral stimuli. For example, in visual search tasks, the detection of a target amid distractors is quicker when the target is emotional that is opposite to neutral target (Ohman et al., 2001). Previous work points towards emotionally salient information limiting humans' ability to attend during complex tasks (Black, 2008; Mi-Hyun Choi, 2010).

Moreover, emotionally congruent information (e.g., sad content in case of being depressed) put additional load on working memory (Baddeley, 2003). It is also established that different emotional states affect people's motivation to solve rather complex cognitive tasks (Melton, 1995) and that the emotional state affects the way attention is allocated, even with positive material (Gable and Harmon-Jones, 2013).

In addition to this, emotional stimuli activate the amygdala, even when individuals are unaware about the information been presented (Morris, Ohman, and Dolan, 1998; Vuilleumier et al., 2001; Whalen et al., 1998). Subjects are more likely to recognize an emotional stimulus rather than a neutral stimulus presented in the contra-lesional field (Vuilleumier and Schwartz, 2001).

Researchers have also found that the existence of task-irrelevant negative emotional stimuli during completion of task altered task performance. When, task-irrelevant negative emotional stimuli are introduced, it generates delay in decision making for directionality (Cohen and Henik, 2012). The introduction of fearful faces also generates performance decrement in reaction time (Dennis, Chen, and McCandliss, 2008). All these studies utilized task-irrelevant emotional stimuli, but in numerous real-world situations, emotional stimuli are significant for the task at hand.

Apparently, different emotional reactions can be brought by the appearance of visual stimuli with affective content. It is important that emotional stimuli are processed and linked with cognitive functions, such as attention and memory. It is the emotional content of any stimuli that affects the division of attention, to the extent that emotional stimuli are prone to "grab" attention, (Bargh, Chaiken, Govender, and Pratto, 1992; Pratto and John, 1991; Reimann and McNally, 1995; Williams, Mathews, and MacLeod, 1996) and to gain prioritized processing (Anderson and Phelps, 2001; Dolan, 2000; Tabert et al., 2001). All this evidence advocates that emotional content enhance

the probability that individuals retain information over long delays. This is the emotional memory enhancement effect and stimuli that have included pictures, words, stories, and narrated slide shows form the content as well as material for the research work.

A number of researches exhibit that anxious individuals demonstrate an attention bias towards threatening sources of information, and this effect is less consistent and not observed in non-anxious individuals (Bar-Haim et al., 2007; Mogg and Bradley, 1998). However, more recent studies focus on qualitatively different types of biases, including preferential engagement, difficulty in disengagement, or attention avoidance (Cisler and Koster, 2010; Sheppes et al., 2013).

It is also obvious that affective or emotional words, scenes or facial expressions elicit well-investigated emotional responses from individuals. A sentence is considered emotive when it contains specific linguistic features which were used to produce a sentence uttered with emphasis (Ptaszynski et al., 2009). Many words and expressions convey nothing more than a positive or negative attitude. Words like lovely, wonderful, good, great and beautiful typically are used to express approval. Such words are said to have **positive emotive content**. Whereas, words like disgusting, despicable, bad, stupid and ugly are used to express disapproval have a **negative emotive content**.

Furthermore, intuition and affect have been deserted topics in the literature on human judgment and decision making for a long time. But now, it is largely recognized that emotions are in multiple ways engaged in judgments, intuitions, and decisions. The source of understanding intuition can be traced back to the heuristics-and-biases approach (Kahneman, Slovic, and Tversky, 1982) that visualized deviations of human judgments from normative models.

A good number of emotions are socially constructed, and their primary function is to regulate and synchronize social interactions, which most people master intuitively no matter what happens. Price and Norman (2008) emphasizes that intuition is neither entirely conscious nor entirely unconscious. They describe the concept of fringe consciousness (Mangan, 2003) and conceptualize intuitive processing as an informative conscious feeling without conscious access to the antecedents of the feeling. If intuitive signals are conscious, they need to be scrutinized and their influence on behavior is controlled by the individual in a flexible and contextually insightful mode.

Pfister and Böhm (2008) emphasize the multiplicity of the role that emotions play in decision making. They formularized that emotions are not a consistent phenomenon, but that four types of emotion should be differentiated according to the role that the emotion takes up in the decision making process. One function is to provide information about pleasure and pain for preference construction. This involves emotions such as joy or distress, that is, emotions that do not imply particular cognitive appraisals of the decision situation other than the interpretation of its hedonic quality.

The second function is to enable rapid choices under time pressure; this function is served by arousal states or affects programs, a typical example is the fear response. The third function is to focus attention on relevant aspects of a decision problem. This function is served by specific emotions such as regret and disappointment. The fourth function is to generate commitment concerning morally and socially significant decisions. This function is served by moral sentiments such as guilt, which prevent people from committing morally blameworthy actions.

Previous studies on mental imagery have mostly used highly salient and well-known stimuli that are stored in long-term memory, such as words, letters, common objects or faces of celebrities. Concerning emotion, a few studies suggest that imagery of

emotional contents can induce affective responses in the form of, for instance, activations of the autonomic nervous system and several brain structures known to play a role in emotion processing (e.g., amygdala). Many experimental findings support the idea that mental imagery involves activations of neural structures and associated functional mechanisms that are also recruited during perception, and that emotion related cortical structures and the autonomic system are involved when emotional contents are imagined (e.g., Kosslyn et al., 2009).

ERP research on imagery has focused on emotionally neutral stimuli, such as letters (Farah, 1985, 1988; Qui et al., 2007), words (West and Holcomb, 2000), objects or faces with neutral expression (Ganis and Schendan, 2008; Wu et al., 2012). For example, Farah (1985, 1988) compared the perception of objects with and without additional instruction to imagine the same objects and reported facilitated perception, suggesting an interaction of perception and imagery at some common locus of activity. Considering the above stated conceptual framework it seems clear that emotions and cognitive aspects have certain connection that needs to be explored from multiple dimensions. Further, the recent researches were also explored and the summary of those researches is as follows:

SUMMARY OF PREVIOUS RESEARCHES

Nandya and Joseph	2016	They analyze the Emotional Intelligence and Mental Imagery of Information Technology (IT) and Physical Education (PE) students. The result shows that, Emotional Intelligence was significance to PE girls than IT girls, but in the case of boys no significance found. The MIQ subtest 'visual' imagery was significance to PE boys and girls than IT boys and girls. 'Bodily' imagery was significance to PE girls than IT girls and there were no significance found in boy's Bodily imagery. All other MIQ sub-tests of Auditory, Gustatory, Olfactory and Tactual imagery no significance difference shown between IT and PE boys and girls.

Bartsch et al.	2015	Found that pleasant and unpleasant verbs which aroused mental imagery have higher levels of alpha amplitude in comparison to imagery elicited by emotionally neutral verbs.
Carretié	2014	They review 55 experiments done on the visual modality in which both emotional and neutral irrelevant distractors are presented at the same time as ongoing task targets. Qualitative and meta-analytic descriptions of results confirmed by behavioral and/or neural indices showed that emotional distractors capture exogenous attention to a significantly greater extent than do neutral distractors.
Schendan and Ganis	2012	Used a matching task to reveal top-down cortical mechanisms for mental simulation of faces and objects. They found that top-down processes of mental imagery sustain an imagistic representation that mimics perception sufficiently to prime subsequent perception.
Chaffey, Unsworth and Fossey	2012	Investigated the relationship between intuition and emotional intelligence among occupational therapists in mental health practice. They conducted a survey on 534 occupational therapists. A moderate relationship was found between intuitive cognitive style and emotional intelligence.
Morina et al.	2011	Compare healthy adults with those having clinical depression or anxiety and concluded that the adults with depression have lower imagery vividness (i.e., visual clarity) for positive scenarios.
Sessa et al.	2010	Visual working memory for the identity of faces is significantly better for faces bearing fearful expression than for faces bearing a positive or neutral expression.
Holmes, Lang, & Shah	2009	Revealed that positive mental imagery have a greater potential to buffer the emotional impact of a negative mood induction than does positive verbal thought.
Kim et al.	2007	Studied the activations of the amygdala and several other brain areas when participants imagined affective compared to neutral facial expressions of unfamiliar persons. They revealed that the brain areas involved in the perception of facial expressions are also active during imagery, with the amygdala playing a central role.
Holmes et al.	2006	Compare the effect of emotional impact of imagery and verbal conditions. They found that healthy participants in the mental imagery generation condition reported greater increases in positive affect in comparison to those in the verbal condition (M = -6.08, SD = 9.63), as measured using the Positive and Negative Affect Schedule.

Hare et al.	2005	Utilize a go/no-go task with affective facial expressions as cues found slowed responses to fearful expressions that were associated with amygdala activation and difficulty inhibiting responses to happy faces that was inversely related to caudate nucleus activity.
Blanchette and Richards	2004	Found that emotions impair reasoning performance no matter whether they are positive or negative.
Schwarz and Skurnik	2003	Concluded that emotions have an influence on thinking and solving cognitive tasks.
Bolte, Goschke and Kuhl	2003	They investigated the effects of emotional states on the ability to make intuitive judgments about the semantic coherence of word triads. On the basis of two experiments, they concluded that positive mood potentiates spread of activation to weak or remote associates in memory, thereby improving intuitive coherence judgments. By contrast, negative mood appears to restrict spread of activation to close associates and dominant word meanings, thus impairing intuitive coherence judgments.
Baumann and Kuhl	2002	Found that participants, in a sad mood, performed worse on the coherence task (measure intuition) in comparison to those who are able to regulate negative emotions.
Vuilleumier et al.	2001	Used the house–face task and found an enhanced amygdala response to negative faces, as compared with neutral faces, also when they were distractors (attention to houses).
Kuhl	2000	They found that an increase in positive affect, by potentiating spread of activation to weak associates, should improve the ability to make intuitive coherence judgments, whereas a negative mood, by restricting spread of activation to close associates and dominant word meanings, should impair intuitive coherence judgments.
Spies et al.	1996	Showed that negative mood hinder performance on tests of problem solving, working memory, and attention.
Lang et al.	1993	Found an increase of heart and breathing rate and skin conductance not only when participants viewed pictures of threatening objects but also when the objects were mentally visualized.
Bowers et al.	1990	Studied the intuition in word triads and revealed that participants were able to decide at an above chance level whether or not word triads were coherent even if they did not retrieve this solution word consciously (intuitive thought).

GAP ANALYSIS AND RESEARCH DIRECTIONS:

The above researches showed that the positive and negative emotions influence the attention, working memory, logical reasoning and other aspects of cognition. Researches have also shown that the fearful events lowered the working memory. The previous studies have also shown that the emotions are responsible for the changes in the bodily as well as brain activities.

They also found the effect of positive and negative affect on intuitive judgments. Researches have also revealed the impact of emotion on mental imagery and found lower vivid imagery in persons having depression.

During the review the connection of emotions with cognition is found but the present research is important for the following reasons:

- The researches done in the past only focuses on the positive and negative emotions. The present study will focus on the six primary emotions and their impact.
- Previous studies used emotional faces, words and tasks to measure effect of emotion on cognition. The present research will utilize emotive and non-emotive video clips of six different primary emotions. Both audio-visual and performance tasks will be used at the same time to get an overall assessment of the impact on cognitive functions.
- The researches done earlier usually demonstrated the effect of imagery on emotions but the present investigation aims to investigate the effect of emotions on mental imagery.
- Few studies have demonstrated the effect of emotion on attention but the effect on vigilance specifically is not as such studied, which will be investigated in the present research.

- Few studies have studied the relationship between emotion and intuition and have inconclusive results. Thus the present investigation proposes a search and analysis in this direction.
- Studies with an intervention program to control the impairment in cognitive functioning, if any, caused by emotions were not found in Indian context. Here in this study the researcher will also include an intervention for those students who are facing the problem of not being able to perform better because they find it difficult to perform after an emotional turmoil or stress.
- The study also intends to make an assessment of the impact by using some of the sophisticated devices giving measures of the physiological changes caused by any emotive or non-emotive situations.

Thus, the present research adds some new dimensions in the field of emotions and its effects on cognitive functioning.

METHOD

The study will be conducted in two parts i.e. **Part 'A'** will include two phases: **Phase I** devoted to selecting various emotive and non-emotive stimuli (videos on six primary emotions) and tasks. During this phase a pilot study will also be conducted. In the **Phase II**, data collection on a selected sample will be done and a pre and post measure will be taken. In the **Part 'B'** of the study, intervention will be given and its impact on cognitive Functions (vigilance, intuitive decision making and mental imagery) of the students will be measured and compared. Physio-Pac data (EEG and GSR only) will also be taken for the students, given intervention.

PART 'A' Phase I:

OBJECTIVE:

To identify emotive (six primary emotion videos) and non-emotive stimuli capable of influencing cognitive Functions i.e. vigilance, intuitive decision making and mental imagery of the students.

OPERATIONAL DEFINITIONS OF THE TERMS USED:

Emotive stimuli, are capable of arousing intense emotional feelings, for example a video clip showing intense emotions arouse emotions of viewers.

Non-emotive stimuli, are neutral and objective in content and do not arouse intense feelings, for example a video on math lecture or a historical documentary video clip.

Emotive tasks are capable of arousing intense emotional feelings, for example words arousing intense emotions in the person.

Non-emotive tasks are neutral in content, for example some simple arithmetic calculations like addition.

EMOTIVE AND NON-EMOTIVE STIMULI AND TASKS SELECTION:

A group of 20 college students (20-30 years), having average emotionality and Intelligence level, will be selected and shown many emotive videos as a part of the pilot study. The students will be asked to rank the videos based on the degree of specific emotional arousal. Their introspection report will be taken to get a feedback on which, particular emotion did the video arouse. Then, the videos will be shown to some experts who will also be requested to rank the videos and provide their expert comments on the specific emotion the video clips are capable of arousing.

Based on a consensus, the videos will be selected after combining the ranking given by both students and experts. The inter-scorer reliability will also be calculated and the videos will also be validated. The same procedure will be applied for selecting the

emotive tasks, in which, the students and experts will rate the words evoking emotions. For the non-emotive task, some simple mathematical calculations will be given, for which, elementary sums of addition or subtraction will be chosen.

PART 'A' Phase II:

After the selection of the stimuli and tasks, in the Phase II the actual experiment will be conducted to generate data.

OBJECTIVES: 1) To study the impact of Emotive (Treatment-1) and Non-emotive (Treatment-2) stimuli on cognitive Functions i.e. vigilance, intuitive decision making and mental imagery of the students.

2) To study the impact of Emotive (Treatment-3) and Non-emotive (Treatment-4) tasks on cognitive Functions i.e. vigilance, intuitive decision making and mental imagery of the students.

HYPOTHESES:

- The emotive student's group (emotive stimuli and task) will show a significant difference in the pre and post measure of cognitive functions i.e. vigilance, intuitive decision making and mental imagery.
- Non-emotive student's group (non-emotive stimuli and task) will not show any significant difference in the pre and post measures of the cognitive functions i.e. vigilance, intuitive decision making and mental imagery.
- The emotive and non-emotive stimuli and tasks will show difference in their impact on the cognitive functions i.e. vigilance, intuitive decision making and mental imagery of the students.

OPERATIONAL DEFINITIONS OF THE TERMS USED:

- **EMOTIONALITY:** Emotionality refers to the reactive component of emotions. It has been conceptualized as individual differences in thresholds of reaction, latency, intensity, and recovery time, i.e., how easily and how intensely emotions are aroused.
- **VIGILANCE:** Vigilance refers to situations in which nothing much is happening, but a person pays attention in the hope of detecting something whenever it does happen.
- **INTUITIVE DECISION MAKING:** Intuitive Decision Making is the ability to acquire knowledge without proof, evidence, or conscious reasoning, or without understanding how the knowledge was acquired.
- **MENTAL IMAGERY:** Mental imagery refers to the ability to reactivate modality-specific mental representations from memory and to manipulate these representations without overt motor activity.

VARIABLES:

Independent Variables: Nature of treatment:

1) Emotive Stimuli (Treatment-1) and task (Treatment-3)
2) Non-Emotive Stimulus (Treatment-2) and task (Treatment-4)

Dependent Variables: Cognitive Functions:

1) Vigilance
2) Intuitive Decision Making
3) Mental Imagery

SAMPLE: A purposive sample comprising of approximately 300 college students, average on emotionality and intelligence, will be selected. All students will be right handed and having attention span around 5 to 9.

Inclusion Criteria:

- The students will be selected from Universities, Colleges and Institutions in and around Agra. The students will be unmarried and both working and not working students will be included.
- The age range of the students will be 20-30 years.
- Both male and female students doing Under Graduation and above will be selected.
- Out of these, students will be randomly assigned to nine groups formed for administering different treatments and collecting data.

Exclusion Criteria:

- Age groups below 20 and above 30 years will be excluded from the sample.
- The students with extremely high and low emotionality and Intelligence and with any medical or mental difficulties will be excluded. Those who witnessed any severe and intense emotional threat in their life will also be excluded from the sample.
- Further, left-handed, persons who do not meet the criteria for average attention span and married individuals will also be excluded from the sample as married individuals altogether have different mindset in their life with many emotional and family hassles experienced already. This needs to be controlled.

TOOLS:

The following tools will used to measure the variables under consideration for the study.

Eysenck Personality Profiler (EPP): The Eysenck Personality Profiler (EPP) measures 21 traits of personality that is consistent with the three major dimensions of personality as defined by Eysenck. The questionnaire was developed by Eysenck and

Wilson (2008). Neuroticism: (called Emotionality in the EPP) includes the dimension of Inferiority, Unhappiness, Anxiety, Dependence, Hypochondria, Guilt and obsessiveness. The high N score is an anxious, worrying individual and overly emotional, reacting too strongly to all sorts of stimuli. EPP is highly reliable and valid tool to measure personality.

Standard Progressive Matrices: Standard Progressive Matrices (SPM) is the part of Raven's Progressive Matrices, originally developed by Raven in 1936. SPM is a non-verbal group test typically used in educational settings. It measures Spearman's g (general) factor of intelligence. The booklet comprises five sets (A to E) of 12 items each, with items within a set becoming increasingly difficult, requiring ever greater cognitive capacity to encode and analyze information. It has high split-half reliability and factorial validity.

Bourdon-Wiersma vigilance test: This dot cancellation test is used to measure perceptual speed and perceptual accuracy indicating vigilance of students. The test consists of 50 rows of groups of 3, 4 or 5 dots with 8 groups of 4 dots in each row. The task is to strike out the groups of 4 dots in each row as accurately and quickly as possible within 4 minutes time. The test is sufficiently reliable and valid and used for various researches earlier.

Zener Cards: Zener cards are cards used to conduct experiments for intuition. These cards were designed by Karl Zener in the early 1930s. These cards have five simple symbols which are: a hollow circle (one curve), a Greek cross (two lines), three vertical wavy lines (or "waves"), a hollow square (four lines), and a hollow five-pointed star. There are 25 cards in a pack, five of each design. The participants try to guess the cards intuitively. The test is highly reliable and valid.

Mental Imagery Questionnaire (MIQ): M.I.Q. is developed by Rajamanickam (1995) designed to assess the sensory experiences of the individuals. This Questionnaire has six subtests referring to six areas of sensory experiences- (i) visual, (ii) auditory, (iii) gustatory, (iv) olfactory, (v) tactual, and (vi) bodily. Thus, 15 x 6 = 90 items are included in the Questionnaire. The test is sufficiently reliable and valid.

Word Completion Task: It is the emotive task used for the present study, developed by Anderson (2003). The task consists of a list of words with letters missing and that participants are supposed to fill in the blanks to make complete words. They have to complete as much of the word task as they could in five minutes. Responses were coded into the following categories: emotive words, neutral words, ambiguous words, and non-words. Anderson, Carnagey, and Eubanks (2003) used this test and established the reliability and validity of the test which was quite high.

Additional Test: It is the non-emotive task of simply adding the digits in the present study.

RESEARCH DESIGN: Pre and Post Test design will be used to compare the impact of the emotive and non-emotive stimuli and task on cognitive functions i.e. vigilance, intuitive decision making and mental imagery.

PROCEDURE:

A pool of 300 students with average emotionality and intelligence will be formed. A pre-test of cognitive functions i.e., vigilance, intuitive decision making and mental imagery will be administered to all the students. After a month, the students will be matched on criteria and divided into nine groups and each group will receive one treatment (six emotive stimuli and a non-emotive stimulus, emotive task and non-emotive task). After giving the treatments, a post-test of cognitive functions will be taken. Conditions for pre and post-test will be kept the same.

STATISTICAL TOOL: Wilcoxon T Test will be used to analyze difference in pre and post-test measures of cognitive functions for emotive and non-emotive groups.

PART 'B'

OBJECTIVE: To compare the brain functioning of the students for Emotive and Non-emotive stimuli.

VARIABLES:

Independent Variables: Emotive and Non-emotive Stimuli

Dependent Variable: Brain Activities (measured by EEG and GSR)

SAMPLE: The study will be conducted on 15-30 college students purposively selected from Part 'A' – Phase II of the study, irrespective of their gender. These students will be identified on the basis of their cognitive function scores. Those willing students showing massive disturbances in their Physio-Pac measures compatible with the low scores on cognitive functions will be taken for the intervention.

TOOLS:

PHYSIO-PAC: The Physio-Pac measures the particular brain functioning of the person. It has 8 channels but only EEG and GSR will be measured by 8 Channel computerized polygraph Test (Physio-pac PP 4), manufactured by Medicaid Systems, Chandigarh, India. The readings of these measures will be analyzed with the help of an expert.

1. **Measurement of Alpha EEG**

Recordings of Alpha EEG will be made on a computerized polygraph (Model Physio-pac, PP 4, Medicaid Systems, Chandigarh, India) test. Alpha EEG will be measured by placing electrodes on forehead of each subject. Values of Alpha EEG are measured in Hz. The range of the Alpha waves is from 8-12 cy/sec.

2. **Measurement of GSR**

Recordings of GSR will be made on a computerized polygraph (Model Physio-pac, PP 4, Medicaid Systems, Chandigarh, India) test. GSR will be measured by placing electrodes on tips of the alternative fingers of each subject. Values of GSR are measured in kilo-ohms.

Broota's Relaxation Technique: This technique has been invented by Broota (1990) and published as "Broota Relaxation Techniques" in National Research Journals as a way to help patients relieve stress and strain. This technique combines four yogic postures and the repetition of a religious word such as shanti (i.e., peace). Broota, Varma and Singh (1995) compared the efficacy of 3 different relaxation techniques i.e., Broota relaxation technique (yoga exercises combined with autosuggestion), Jacobson's progressive relaxation technique (a muscle relaxation technique), and Shavasana (passive relaxation with a yogic posture) on patients and results revealed that all three relaxation techniques were equally effective.

PROCEDURE: First the students will be shown the non-emotive stimuli in the form of historical video clips and their brain activities will be measured. Then, the emotive stimuli (i.e., the videos with intense feelings) will be administered to them and their brain activities will be measured. The time and day of the measures taken will be separate for both stimuli. Physio-Pac (EEG and GSR channels) will be used to measure the brain activities of the students.

INTERVENTION: The students showing exclusive disturbance in their brain activities will be given Broota's Relaxation Technique to restore their normal state of functioning. This method of relaxation will be given to them for 2 months and then the Physio-Pac measures along with cognitive functions (vigilance, intuitive decision making and mental imagery) will be taken to compare the effectiveness of the intervention.

IMPLICATIONS OF THE STUDY: In this era of so much stress and emotional turmoil, students find it difficult to perform, remain vigil, take decisions or channelize their thought processes. The present study proposes to help those students to remain calm and still perform, in case they face such a situation. Existing with numerous distractions in their life, the students tend to get over-sensitive when they confront with such emotional turmoil that are internally as well as externally present in their life. They tend to get disturbed, which consequently is reflected in their cognitive functioning also. This further makes them weaker to handle their situations and a problem of such a stature is more for college level students as they have to make a transition from studies to work, within this time duration. Such students, if identified and provided timely assistance, will be insulated enough so that their cognitive functioning remains effective and does not negatively interfere with their academics. Consequently, they are able to make a smooth transition towards work, which will be a great help to them as a whole.

The study also adds some new dimensions in the field of emotions and its effect on one's cognitive functioning as it intends to measure the changes in brain functioning (measured by EEG and GSR) caused by any emotive or non-emotive situations, which will help to make an assessment as a whole about the magnitude of the problem.

REFERENCES

- Anderson, A.K. & Phelps, E.A. (2001). Lesions of the human amygdala impair enhanced perception of emotionally salient events. *Nature, 411*, 305–9.
- Anderson, C.A., Carnagey, N.L., & Eubanks, J. (2003). Exposure to violent media: The effects of songs with violent lyrics on aggressive thoughts and feelings. *Journal of Personality and Social Psychology, 84*, 960-971.
- Baddeley, A.D. (2003). Working memory: looking back and looking forward. *Nat. Rev. Neurosci., 4*, 829–839. doi:10.1038/nrn1201
- Bargh, J. A., Chaiken, S., Govender, R., & Pratto, F. (1992). The generality of the automatic attitude activation effect. *Journal of Personality and Social Psychology, 62*, 893–912.
- Bar-Haim, Y., Lamy, D., Pergamin, L., Bakermans-Kranenburg, M.J., & van Ijzendoorn, M.H. (2007). Threat-related attentional bias in anxious and nonanxious individuals: a meta-analytic study. *Psychol Bull., 133*(1), 1–24.
- Bartsch, F., Hamuni, G., Miskovic, V., Lang, P. J., & Keil, A. (2015). Oscillatory brain activity in the alpha range is modulated by the content of word-prompted mental imagery. *Psychophysiology, 52*(6), 727–735. doi.org/10.1111/psyp.12405
- Baumann, N. & Kuhl, J. (2002). Intuition, affect, and personality: Unconscious coherence judgments and self-regulation of negative affect. *Journal of Personality and Social Psychology, 83*, 1213–1223.
- Black, S. (2008). The effects of anxiety on affective learning and serial position recall. *International Journal of Neuroscience, 118*, 1269-1285. doi:10.1080/00207450701242933
- Blanchette, I. & Richards, A. (2004). Reasoning about emotional and neutral materials: Is logic affected by emotions? *Psycholo. Sci., 15*, 745-752.
- Bolte, A., Goschke, T., & Kuhl, J. (2003). Emotion and intuition: Effects of Positive and Negative Mood on Implicit Judgments of Semantic Coherence. *Psychological Science, 14*(5), 416-421.
- Bowers, K.S., Regehr, G., Balthazard, C., & Parker, K. (1990). Intuition in the context of discovery. *Cognitive Psychology, 22*, 72–110.

- Broota, A. & Dhir, R. (1990). Efficacy of two relaxation techniques in depression. *Journal of Personality and Clinical Studies, 6*(1), 83-90.
- Broota, A., Varma, R., & Singh, A. (1995). Role of relaxation in hypertension. *Journal of the Indian Academy of Applied Psychology, 21*(1), 29-36.
- Carretié, L. (2014). Exogenous (automatic) attention to emotional stimuli: a review. *Cogn Affect Behav Neurosci., 14*, 1228–1258. doi. 10.3758/s13415-014-0270-2
- Chaffey, L., Unsworth, C.A., & Fossey, E. (2012). Relationship between Intuition and Emotional Intelligence in Occupational Therapists in Mental Health Practice. *The American journal of occupational therapy, 66*(1), 88-96.
- Cisler, J. M. & Koster, E. H. (2010). Mechanisms of attention biases towards threat in anxiety disorders: An integrative review. *Clinical psychology review, 30*(2), 203-216.
- Cohen, N. & Henik, A. (2012). Do irrelevant emotional stimuli impair or improve executive control? *Front. Integr. Neurosci., 6*, 33. doi:10.3389/fnint.2012.00033
- Darke, S. (1988). Anxiety and working memory capacity. *Cognition and Emotion, 2*, 145–154.
- Dennis, T.A., Chen, C., & McCandliss, B.D. (2008). Threat-related attentional biases: An analysis of three attentional systems. *Depression and Anxiety, 25*, E1 – E10.
- Dolan, R. J. (2000). Emotional processing in the human brain revealed through functional neuroimaging. In M. S. E. Gazzaniga (Ed.). *The new cognitive neurosciences* (pp. 1115–1132). Cambridge, MA: MIT Press.
- Elliman, N. A., Green, M. W., Rogers, P. J., & Finch, G. M. (1997). Processing efficiency theory and the working memory system: Impairments associated with subclinical anxiety. *Personality and Individual Differences, 23*, 31–35.
- Farah, M.J. (1985). Psychophysical evidence for a shared representational medium for visual images and percepts. *J. Exp. Psychol. Gen., 114*, 93–105.
- Farah, M.J. (1988). Is visual imagery really visual? Overlooked evidence from neuro-psychology. *Psychol. Rev., 95*, 307–317.
- Forgas, J.P. (2008). Affect and cognition. *Perspect. Psychol. Sci. 3*, 94–101.

- Gable, P.A. & Harmon-Jones. (2013). Does arousal per se account for the influence of appetitive stimuli on attentional scope and the late positive potential? *Psychophysiology, 50*, 344–350. doi:10.1111/psyp.12023
- Ganis, G. & Schendan, H.E. (2008). Visual mental imagery and perception produce opposite adaptation effects on early brain potentials. *NeuroImage, 42*, 1714–1727.
- Gray, J.R. (2001). Emotional modulation of cognitive control: Approach-withdrawal states double-dissociate spatial from verbal two-back task performance. *Journal of Experimental Psychology: General, 130*, 436-452.
- Hare, T.A., Tottenham, N., Davidson, M.C., Glover, G.H., & Casey, B.J. (2005). Contributions of amygdala and striatal activity in emotion regulation. *Biological Psychiatry, 57*, 624–632.
- Holmes, E. A., Lang, T. J., & Shah, D. M. (2009). Developing interpretation bias modification as a 'cognitive vaccine' for depressed mood—Imagining positive events makes you feel better than thinking about them verbally. *Journal of Abnormal Psychology, 118*(1), 76–88. doi.org/10.1037/a0012590
- Holmes, E. A., Mathews, A., Dalgleish, T., & Mackintosh, B. (2006). Positive interpretation training: effects of mental imagery versus verbal training on positive mood. *Behavior Therapy, 37*(3), 237–247. doi.org/10.1016/j.beth.2006.02.002
- Kahneman, D., Slovic, P., & Tversky, A. (1982). *Judgment under uncertainty: Heuristics and biases*. Cambridge, MA: Cambridge University Press.
- Kim, S. E., Kim, J. W., Kim, J. J., Jeong, B. S., Choi, E. A., Jeong, Y. G., et al. (2007). The neural mechanism of imagining facial affective expression. *Brain Research, 1145*, 128–137. doi.org/10.1016/j.brainres.2006.12.048
- Kosslyn, S.M., Ganis, G., & Thompson, W.L. (2009). Mental imagery. In G.G. Bernston & J.T. Cacioppo (Eds.). *Handbook of Neuroscience for the Behavioral Sciences* (pp. 383-394). New York: John Wiley & Sons.

- Kuhl, J. (2000). A functional-design approach to motivation and self-regulation: The dynamics of personality systems interactions. In M. Boekaerts, P.R. Pintrich, & M. Zeidner (Eds.). *Handbook of self-regulation* (pp. 111–169). San Diego, CA: Academic Press.
- Lang, P.J., Greenwald, M.K., Bradley, M.M., & Hamm, A.O. (1993). Looking at pictures: Affective, facial, visceral, and behavioral reactions. *Psychophysiology, 30*, 261–273.
- Lazarus, R.S. (1991). *Emotion and Adaptation*. NewYork, NY: Oxford University Press.
- Mangan, B. (2003). The conscious "fringe": Bringing William James up to date. In B.J. Baars, W.P. Banks, & J.B. Newman (Eds.). *Essential sources in the scientific study of consciousness* (pp. 741–759). Cambridge, MA: The MIT Press.
- Melton, R.J. (1995). The role of positive affect in syllogism performance. *Pers.Soc. Psychol.Bull., 21*, 788–794. doi:10.1177/0146167295218001
- Mi-Hyun Choi. (2010). Changes in cognitive performance due to three types of emotional tension. *International Journal of Bio-Science & Bio-Technology, 2*(4), 23-28.
- Mogg, K. & Bradley, B.P. (1998). A cognitive-motivational analysis of anxiety. *Behavior Research and Therapy, 36*, 809–848.
- Morina, N., Deeprose, C., Pusowski, C., Schmid, M., & Holmes, E.A. (2011). Prospective mental imagery in patients with major depressive disorder or anxiety disorders. *Journal of Anxiety Disorders 25*(8), 1032–1037. doi.org/10.1016/j.janxdis.2011.06.012
- Morris, J.S., Ohman, A., & Dolan, R.J. (1998). Conscious and unconscious emotional learning in the human amygdala. *Nature, 393*, 467–70.
- Nandya, V. & Joseph, P.T. (2016). Emotional Intelligence and Mental Imagery of Information Technology and Physical Education Students. *International Journal of Scientific Research, 5*(2), 90-91.
- Ohman, A., Flykt, A., & Esteves, F. (2001). Emotion drives attention: detecting a snake in the grass. *J. Exp. Psychol.: Gen. 127*, 69– 82.
- Pfister, H. & Böhm, G. (2008). The multiplicity of emotions: A framework of emotional functions in decision making. *Judgment and Decision Making, 3*, 5-17.

- Pratto, F. & John, O. P. (1991). Automatic vigilance: The attention-grabbing power of negative social information. *Journal of Personality and Social Psychology, 61*, 380–391.
- Price, M.C. & Norman, E. (2008). Intuitive decisions on the fringes of consciousness: Are they conscious and does it matter? *Judgment and Decision Making, 3*(1), 28-41.
- Ptaszynski, M., Dybala, P., Rzepka, R., & Araki, k. (2009). Affecting Corpora: Experiments with Automatic Affect Annotation System - A Case Study of the 2channel Forum. *In Proceedings of The Conference of the Pacific Association for Computational Linguistics, 9*, 223-228.
- Qui, J., Li, H., Liu, Q., & Zhang, Q. (2007). Brain mechanisms underlying visual perception and visual mental imagery of Chinese pseudo-characters: an event-related potential study. *Brain Res., 1184,* 202–209.
- Rajamanickam, M. (1995). *Mental Imagery Questionnaire*. National Psychological Corporation: Agra.
- Reimann, B. & McNally, R. (1995). Cognitive processing of personally relevant information. *Cognition and Emotion, 9,* 324–340.
- Schendan, H.E. & Ganis, G. (2012). Electrophysiological potentials reveal cortical mechanisms for mental imagery, mental simulation, and grounded (embodied) cognition. *Front. Psychol., 3*, 1–22.
- Schwarz, N. & Skurnik, I. (2003). Feeling and thinking: implications for problem solving. In J.E. Davidson & R. Sternberg (Eds.). *The Psychology of Problem Solving* (pp. 263–292). Cambridge: Cambridge University Press.
- Sessa, P., Luria, R., Gotler, A., Jolicoeur, P., & Dell'Acqua, R. (2010). Interhemispheric ERP asymmetries over inferior parietal cortex reveal differential visual working memory maintenance for fearful versus neutral facial identities. *Psychophysiology, 48*, 187–197.
- Sheppes, G., Luria, R., Fukuda, K., & Gross, J. J. (2013). There's more to anxiety than meets the eye: Isolating threat related attention engagement and disengagement biases. *Emotion, 13*(3), 520.

- Smith, C.A. & Lazarus, R.S. (1993). Appraisal components, core relational themes, and the emotions. *Cognition and Emotion, 7*, 233–269.
- Spies, K., Hesse, F. W., & Hummitzsch, C. (1996). Mood and capacity in Baddeley's model of human memory. *Zeitschrift fur Psychologie, 204*, 367–381.
- Tabert, M. H., Borod, J. C., Tang, C. Y., Lange, G., Wei, T. C., Johnson, R., et al. (2001). Differential amygdala activation during emotional decision and recognition memory tasks using unpleasant words: An fMRI study. *Neuropsychologia, 39*, 556–573.
- Vuilleumier, P. & Schwartz, S. (2001). Modulation of visual perception by eye gaze direction in patients with spatial neglect and extinction. *Neuroreport, 12*, 2101–2104.
- Vuilleumier, P., Armony, J.L., Driver, J., & Dolan, R.J. (2001). Effects of attention and emotion on face processing in the human brain: an event-related fMRI study. *Neuron, 30*, 829–41.
- West, W.C. & Holcomb, P.J. (2000). Imaginal, semantic, and surface-level processing of concrete and abstract words: an electrophysiological investigation. *J. Cogn. Neurosci., 12*, 1024–1037.
- Whalen, P.J., Rauch, S.L., Etcoff, N.L., McInerney, S.C., Lee, M.B., & Jenike, M.A. (1998). Masked presentations of emotional facial expressions modulate amygdala activity without explicit knowledge. *J. Neurosci., 18*, 411–18.
- Williams, J. M., Mathews, A., & MacLeod, C. (1996). The emotional Stroop task and psychopathology. *Psychological Bulletin, 120*, 3–24.
- Wu, J., Duan, H., Tian, X., Wang, P. & Zhang, K. (2012). The effects of visual imagery on face identification: an ERP study. *Front. Hum. Neurosci., 6*, 1–8.

Proposed Videos to be used:

- Bakle, A. (2013, March 13). Save girl child presentation video (Video file). Retrieved from https://m.youtube.com/watch?v=klyug7546UTF.
- Bawane, P. (2015, March 2). An Emotional Song - Beti Ki Pukar (Video file). Retrieved from https://m.youtube.com/watch?v=hgyjnf6890HKB.

- Driven Films (2016, June 12). Think Twice before food wastage-Short film (Video file). Retrieved from https://m.youtube.com/watch?v=zlHx-YIKfsc.
- Gaurs (2007, October 15). Help Age India (Video file). Retrieved from https://m.youtube.com/watch?t=jfvfh334HFJ.
- Mahajan, N. (films jai maa). (2012, May 8). *Short films on old age* (Video file). Retrieved from https://m.youtube.com/watch?v=h-_XLDXT1GQ.
- Motivation US (2014, April 5). Inspirational Video - You can be a hero too (Video file). Retrieved from https://m.youtube.com/watch?v=Tjnq5StX68g.
- Movie Smashing™ (2014, April 21). Really most heart touching story (Video file). Retrieved from https://m.youtube.com/watch?v=NFzD82iuRVY.
- Paryal, M. (2016, May 29). Don't charge for humanity (Video file). Retrieved from https://m.youtube.com/watch?v=7rPzYtoYuLw.
- Petko petkov (2013, May 4). Most brutal natural disaster (Video file). Retrieved from https://m.youtube.com/watch?v=Lbuhy456TGN.
- Thakur, M. (2014, August 19). *Honesty pays- Life changing act- Short film* (Video file). Retrieved from https://m.youtube.com/watch?v=lE39JS71RLo.